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CLAIMS

1. The use of an aqueous treatment solution containing sulfate ions SO_4^{2-} with a concentration of
5 not less than 0.01 mol/l in order to treat the surface of a steel sheet treated on at least one of its sides with a metal coating based on zinc or its alloys, for the purpose of reducing the formation of metal powder or particles based on zinc or its alloys generated by
10 the degradation of the coating while said sheet is being formed.
2. The use as claimed in claim 1, in which the aqueous treatment solution furthermore contains Zn^{2+}
15 ions with a concentration of not less than 0.01 mol/l.
3. The use as claimed in either of claims 1 and 2, in which the conditions under which the treatment solution is applied to the surface of the sheet, namely the
20 temperature, the time during which the solution is in contact with the galvanized surface, the SO_4^{2-} ion concentration and the Zn^{2+} ion concentration, are adjusted so as to form a layer based on zinc hydroxysulfate and zinc sulfate, the sulfur content of
25 which is not less than 0.5 mg/m².
4. The use as claimed in any one of claims 1 to 3, in which the Zn^{2+} ion concentration and the SO_4^{2-} ion concentration are between 0.07 and 0.55 mol/l.
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5. The use as claimed in any one of claims 1 to 4, in which the pH of the treatment solution is between 5 and 7.
- 35 6. The use as claimed in any one of claims 1 to 5, in which the conditions under which the treatment solution is applied, namely the temperature, the time during which the solution is in contact with the galvanized surface and the SO_4^{2-} ion and Zn^{2+} ion concentrations,

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are adjusted so as to form a hydroxysulfate/sulfate-based layer having a sulfur content of between 3.7 and 27 mg/m².

- 5 7. The use as claimed in any one of claims 1 to 6, in which, after the treatment solution has been applied to the sheet, said sheet is dried, after having optionally been rinsed in order to remove the soluble portion of the hydroxysulfate/sulfate layer.
- 10 8. The use as claimed in claim 1, in which the treatment solution is applied under anodic polarization and the pH of the treatment solution is equal to 12 or higher, but less than 13.
- 15 9. The use as claimed in claim 8, in which the density of electrical charges flowing during the treatment through the surface of the sheet is adjusted in order to form a zinc hydroxysulfate/zinc sulfate-based layer, the sulfur content of which is 0.5 mg/m² or higher.
- 20 10. The use as claimed in either of claims 8 and 9, in which the SO₄²⁻ ion concentration is greater than 0.07 mol/l.
- 25 11. The use as claimed in any one of claims 8 to 10, in which the electrical charge density is adjusted in order to form a zinc hydroxysulfate/zinc sulfate-based layer, the amount of sulfur of which is between 3.7 and 27 mg/m².
- 30 12. The use as claimed in any one of claims 8 to 11, in which the polarization current density applied during the treatment is greater than 20 A/dm².
- 35 13. The use as claimed in any one of claims 8 to 12, in which, after the treatment solution has been applied to the sheet, said sheet is rinsed.

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14. A method of lubricating a steel sheet coated with a layer consisting of a metal coating based on zinc or its alloys, in which method:

5 - said sheet is coated with an upper layer based on zinc hydroxysulfate and zinc sulfate, said upper layer having been obtained by using a treatment solution as defined in any one of claims 1 to 13; and then

10 - a lubricating oil film is applied to the upper layer with a weight of less than 1 g/m².

15 15. The method as claimed in claim 14, characterized in that the weight of the oil film is less than 0.9 g/m².

20 16. The method as claimed in claim 15, characterized in that the weight of the oil film is between 0.2 and 0.5 g/m².

25 17. The use of an aqueous treatment solution containing SO₄²⁻ sulfate ions with a concentration of not less than 0.01 mol/l, in order to treat the surface of a steel sheet coated on at least one of its sides with a metal coating based on zinc or its alloys, for the purpose of improving the temporary corrosion protection of said sheet.